

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5) 09/701455	INTERNATIONAL APPLICATION NO. PCT/US99/11709	ATTORNEY'S DOCKET NUMBER 30427
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21. The following fees are submitted:				CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :					
<input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1,000.00					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00					
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00					
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00					
<input checked="" type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$100.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				\$0.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	18 - 20 =	0	x \$18.00	\$0.00	
Independent claims	2 - 3 =	0	x \$80.00	\$0.00	
Multiple Dependent Claims (check if applicable).			<input type="checkbox"/>	\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$100.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable).				<input checked="" type="checkbox"/>	\$50.00
SUBTOTAL =				\$50.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				+	\$0.00
TOTAL NATIONAL FEE =				\$50.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable).				<input type="checkbox"/>	\$0.00
TOTAL FEES ENCLOSED =				\$50.00	
				Amount to be: refunded	\$
				charged	\$

- ☐ A check in the amount of _____ to cover the above fees is enclosed.
- ☒ Please charge my Deposit Account No. **071971** in the amount of **\$50.00** to cover the above fees.
A duplicate copy of this sheet is enclosed.
- ☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **071971** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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DAVID A. GREENLEE

NAME

20825

REGISTRATION NUMBER

27 NOVEMBER 2000

DATE

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) AND 1.27 (b)) - INDEPENDENT INVENTOR**

Docket No.
30427

Serial No.
PCT/US99/11709

Filing Date
27 MAY 1999

Patent No.

Issue Date

Applicant/ **PAUL E. ADLER**
Patentee:

Invention:

SLURRY TREATMENT AND SHIPPING METHOD

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled above and described in:

- ☐ the specification to be filed herewith.
☒ the application identified above.
☐ the patent identified above.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ No such person, concern or organization exists.
☐ Each such person, concern or organization is listed below.

***NOTE:** Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities (37 CFR 1.27)

FULL NAME **PAUL E. ADLER**

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☒ Individual ☐ Small Business Concern ☐ Nonprofit Organization

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☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

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☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

FULL NAME

ADDRESS

☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF INVENTOR PAUL E. ADLER

SIGNATURE OF INVENTOR Paul E. Adler

DATE: NOVEMBER 27, 2000

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

DATE: _____

NAME OF INVENTOR _____

SIGNATURE OF INVENTOR _____

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DATE: _____

SLURRY TREATMENT AND SHIPPING METHOD

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TECHNICAL FIELD

This invention relates generally to treating contaminatable slurries and, more particularly, to a process and apparatus for sterilizing and a method of shipping these slurries.

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BACKGROUND OF THE INVENTION

Many processes exist for treating mined kaolin during the beneficiation process to improve the physical and chemical aspects of the resulting slurry, or slip, to improve its commercial value. Many of these remove contaminants of various types to improve the whiteness and purity of the kaolin and additionally employ the use of oxidation, leaching and magnetic separation. Such processes are detailed in United States Patent No. 5,397,754.

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Slurries of beneficiated kaolin, calcium carbonate, titanium dioxide, talc, latex, other carbonates and mixtures thereof are used extensively in the paper, paint, rubber and plastics industries as coatings, fillers, extenders and pigments. These slurries are contaminatable (i.e. subject to contamination) by aerobic and anaerobic bacteria. Such contamination affects the color, odor and viscosity of the slurries, which negatively affect their commercial value.

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Many treatments to neutralize the effects of this bacteria on kaolin slurries have been tried. The most conventional treatment is mixing a bactericide into the slurry to kill the bacteria. An example of this treatment is found in United States Patent No. 5,496,398. Unfortunately, this treatment has a very limited period of effectiveness until contamination again occurs, because the

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bacteria are not completely destroyed and exposure to air produces recontamination by the aerobic bacteria that thrive on the available oxygen. Thus, the slurry must be re-treated if it is not quickly used. This repeated use of such chemicals increases the cost of producing and maintaining these slurries at acceptable levels of bacteriological contamination while assuring that the performance properties of the slurries are not degraded.

The limited life of such a treatment process presents a problem when contaminatable slurries are stored for long periods of time, a problem that is exacerbated by the conventional practice of storing slurries in open top tanks. Often, the treated slurries are shipped for long distances by truck, rail or ship, which produce re-contamination for the same reasons.

There is a need for a method of treating and shipping kaolin and calcium carbonate and other contaminatable slurries which eliminates bacterial contamination during storage and shipping and eliminates the necessity for repeated treatment by bactericides.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide for a method of treating and shipping kaolin and calcium carbonate and other contaminatable slurries which eliminates bacterial contamination during storage and shipping and eliminates the necessity for repeated treatment by bactericides.

According to a preferred embodiment of this invention, apparatus is provided for sterilizing slurries subject to aerobic and anaerobic contamination. A slurry piping circuit interconnects a supply tank, three serial heat exchangers, and a storage tank. The circuit and storage tank are sanitized by flushing with hydrogen peroxide. One heat exchanger transfers heat from the sterilized slurry to the unsterilized slurry. A closed hot water piping circuit interconnects a hot

water boiler and the other two heat exchangers. The piping interconnecting the other two heat exchangers is an insulated manifold where the slurry is sterilized. Slurry is pumped through the piping and heated by hot water in the manifold to kill the bacteria, and is stored and covered by a layer of nitrogen. It may be
5 transported to a distant terminus where it is unloaded and again sterilized, if necessary, or be stored locally, or be used immediately in an industrial process.

In one aspect, this invention features a process for sterilizing contaminatable slurries, which comprises the steps of providing a sanitized fluid
10 handling system, pumping the slurry through the system at a predetermined flow rate, heating the slurry to a sterilizing temperature of about 210°F - 290° for a predetermined time to sterilize the slurry, cooling the slurry to a temperature below 100°F, and transferring the sterilized slurry to a sanitized, oxygen-free fluid collection device, which may be a stationary or transportable storage tank
15 or the supply system for a further industrial process.

In another aspect of this invention, the process includes the further steps of excluding oxygen from the tank by covering the sterilized slurry with a blanket of nitrogen, and transporting the storage tank to a terminus for offloading of the
20 slurry and re-sterilizing if necessary.

In yet another aspect, this invention features fluid handling and sterilizing apparatus for sterilizing contaminatable slurries, which includes a supply tank for holding unsterilized slurry, and a sterilizing unit for heating slurry to a sterilizing
25 temperature. A heat exchanger transfers heat from the sterilized slurry to the unsterilized slurry, thus preheating the unsterilized slurry and cooling the sterilized slurry. A slurry piping circuit connects the supply tank to the heat exchanger and connects the heat exchanger to the sterilizing unit for handling the unsterilized slurry, and connects the sterilizing unit to the heat exchanger and
30 exits the heat exchanger for handling the sterilized slurry. A pump pumps slurry

through the piping circuit at a predetermined pressure in order to maintain all slurry in a liquid state, regardless of temperature.

In a further aspect of this invention, the sterilizing unit includes a heating unit, a second heat exchanger for transferring heat from the heating unit to the unsterilized slurry to raise the temperature of the unsterilized slurry to a sterilizing temperature, a manifold for maintaining the heated slurry at the sterilizing temperature, and a third heat exchanger for transferring heat from the sterilized slurry to the heating unit to cool the sterilized slurry.

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These and further objects and features of this invention will become readily apparent from a review of the following detailed description of a preferred embodiment, as illustrated in the accompanying drawings, in which:

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic representation of the apparatus and process according to this invention;

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Fig. 2 is a simplified version of the schematic of Fig. 1, depicting system temperatures measured during successful operation of a sterilizing system according to this invention; and

Figs. 3 and 4 are plan and side views of the system of

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Fig. 1, shown mounted on a semi-trailer.

DESCRIPTION OF THE PREFERRED EMBODIMENT

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Figs. 1 and 2 of the drawings schematically depict the major components of a system 10 for continuously sterilizing contaminatable slurry,

according to a preferred embodiment of this invention. These comprise a supply tank 12, a storage tank 14, serially arranged heat exchangers 16, 18 and 20, a hot water boiler 22, and a manifold 24.

5 A pump 25 at supply tank 12 pumps slurry through a piping system, which includes a supply pipe 26 from pump 25 to heat exchanger 16, a connecting pipe 28, that connects heat exchangers 16 and 18, slurry manifold piping 30, that connects heat exchangers 18 and 20, a connecting pipe 32, that connects heat exchangers 20 and 22, and an outlet pipe 34, that exits heat
10 exchanger 16 and enters storage tank 14. The direction of slurry flow is indicated by arrows in Figs. 1 and 2. Pipe 34 can, alternatively, connect directly into the intake of a further industrial process, such as paper making. Tanks 12 and 14 may be stationary, or mobile, such as mounted on a rail car, semi-trailer, or ship. Indeed, the slurry sterilizing system itself may be stationary or may be
15 mounted on a similar mobile platform for transportation to a variety of locations for on-site processing (e.g. at an industrial plant, at dockside, or in a railroad yard).

 At the initiation of the process of this invention, supply tank 12 will be
20 filled with contaminated, or unsterilized, slurry 40, while storage tank 14 will normally be empty. This process is a continuous process, so that eventually tank 14 will fill with sterilized slurry 42. Prior to initiation of this process, at least tank 14, and pipes 34, 32, and 30, and preferably pipes 28 and 26 will be
25 sanitized by backflushing with a sanitizing agent, such as hydrogen peroxide, supplied from a supply 44 via a delivery nozzle 46. Oxygen is purged from the system by the simultaneous introduction of nitrogen from a supply 50 via a nozzle 52.

 The heating unit for the sterilizing apparatus 10 includes hot water boiler
30 22, and a second or hot water piping system, that includes an outlet pipe 60 from boiler 22 to heat exchanger 18, a connecting pipe 62 connecting heat exchangers 18 and 20, and an inlet pipe 64 connecting heat exchanger 20 to boiler 22. A

pump 66 pumps water through the closed hot water system at a predetermined pressure in the direction indicated by arrows in the drawings. The pressure of the hot water system must be sufficient to preclude formation of steam. The heating unit and manifold 24 comprise the sterilizing unit.

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A prototype/pilot sterilization system, illustrated in Figs. 3 and 4, was constructed on a semi-trailer 70 to test and prove out the process according to this invention. This system utilized a Parker manifold comprising 60 ft. of 4" stainless steel slurry pipe and an array of 2" stainless steel hot water pipe - all enclosed in a stainless steel box containing 3" rock wool insulation. The heating system utilized a 300,000 BTU/hr. propane-fired boiler and a pumping system that pumped hot water at 30 gpm. A peristaltic slurry pump pumped slurry through the system at 17 gpm. Three substantially identical APV plate heat exchangers were interconnected by insulated piping runs of 10 ft. A 35 kW Cummins generator set powered the installation.

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A target sterilizing temperature was set at about 250° F and a holding time of about 2 minutes in the sterilizing manifold. The sterilizing temperature was actually measured at 255° F and the time was about 2 minutes. A preferred temperature range is about 230° F - 270° F, with the time of treatment being longer than 5 seconds for a flash treatment. Treatment time is dependent on the volume of the piping used and treatment temperature. The temperature of the cooled sterilized slurry was 90° F, and a temperature below 100° F is preferred to facilitate handling.

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The system was fogged with a mist composed of a mixture of nitrogen and hydrogen peroxide emitted from tanks through a dual nozzle to sanitize the system. After the system was fired up and brought to temperature, 700 gallons of production beneficiated calcium carbonate slurry, at 75% dry solids and a density of 16 pounds/gallon volume, were pumped through the sanitized system. Temperatures in all segments of the system were monitored, as was water flow.

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Temperatures measured during this run are depicted in Fig. 2. Samples were taken of sterilized slurry to confirm that sterilization was complete. The test was successful, thus proving the process. It is now possible to sterilize contaminatable slurries without using bactericides or other chemicals.

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This process proved to be quite economical, as the heating system recovered 90% of the boiler heat. Thus, only 10% boiler makeup is necessary. This economy results from the use of heat exchangers to transfer heat. As Fig. 2 shows, the incoming 80° F contaminated slurry was pre-heated to 165° F in heat exchanger 16 by the 180° F sterilized slurry, which cooled to an exit temperature of 90° F. The preheated contaminated slurry was elevated to a sterilizing temperature in heat exchanger 18 by 265° F hot water from boiler 22 to a temperature of 255° F, as measured in manifold 24. Hot water, which exited manifold 24 at 173° F, was reheated to 247° F in heat exchanger 20 by sterilized slurry, which then exited at 180° F. Thus the boiler was supplied with 247° F intake water, which it needed to elevate only 18° F.

Preferably, a mist or fog of nitrogen and hydrogen peroxide is used to sanitize the system. Sanitizing chemicals other than hydrogen peroxide may also be used to kill any bacteria in the system. As slurry from supply 40 transits slurry piping 26, 28, 30, 32 and 34 into storage tank 14, this fog is forced into storage tank 14, where the condensed hydrogen peroxide will be drained and the nitrogen will blanket slurry 42 to exclude contact with oxygen

The nitrogen blanket is maintained during any subsequent shipping of tank 14 to a distant terminus by truck, rail or ship. Depending on the degree of sterilization maintained (a function of time and equipment), the transported slurry may again undergo the same sterilization process by another or similar installation of sterilizing equipment 10.

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It is understood that use of the term "contaminatable slurries" herein encompasses any slurry of substances, such as kaolin, calcium carbonate, titanium dioxide, talc, latex, other carbonates, and combinations thereof, which are subject to contamination by aerobic and anaerobic bacteria, and which are
5 used as coatings, fillers, extenders and pigments in the paper, paint, rubber and plastics industries.

While only a preferred embodiment has been illustrated and described, obvious modifications are contemplated within the scope of this invention, as
10 defined by the appended claims. For example, other types of heating systems could be used to sterilize the slurry, although systems using a liquid are preferred because of their efficiency.

I claim:

1. A process for sterilizing a contaminatable slurry, comprising the steps of
 - a. providing a sanitized fluid handling system,
 - b. pumping the slurry through the system at a predetermined pressure,
 - c. heating the slurry to a sterilizing temperature of about 210°F - 290°
5 for a predetermined time to sterilize the slurry,
 - d. cooling the sterilized slurry by transferring heat to the unsterilized slurry entering the process, and
 - e. transferring the sterilized slurry to a sanitized fluid collection device.
2. The process of claim 1, including the step of flushing the fluid handling system with a mist of nitrogen and a sanitizing chemical to sanitize the system.
3. The process of claim 1, wherein the sterilizing temperature is about 230°F - 270° F, the predetermined time is greater than 5 seconds, and the cooling temperature is below 100° F.
4. The process of claim 3, wherein the sterilizing temperature is about 250°F and the predetermined time is about 2 minutes.
5. The process of claim 1, wherein the sanitized fluid collection device is a storage tank, and including the steps of
 - f. flushing the fluid handling system with a mist of nitrogen and a sanitizing chemical to sanitize the system, and
 - g. excluding oxygen from the storage tank, and
 - h. transporting the storage tank to a terminus for offloading of the
5 slurry.
6. The process of claim 5, including the further steps of
 - i. offloading the slurry, and
 - j. repeating steps a - e.

PCT/US99/11709
IPEA/US 12 JUN 2000

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7. The process of claim 1, including the steps of
- f. flushing the fluid handling system with a mist of nitrogen and a hydrogen peroxide to sanitize the system,
 - g. providing a tank as the fluid collection device, and
 - 5 h. excluding oxygen from the tank by covering the sterilized slurry with a blanket of nitrogen.
8. The process of claim 1, wherein the fluid collection device is the supply system of a further industrial process.
9. The process of claim 1, wherein the slurry is kaolin or calcium carbonate.
10. The process of claim 1, including the step of mounting the fluid handling system on a mobile platform for transportability.
11. Fluid handling and sterilizing apparatus for sterilizing contaminatable slurries, comprising
- a pump for pumping the slurry,
 - a sterilizing unit for heating slurry to a sterilizing temperature,
 - 5 a heat exchanger for transferring heat from the sterilized slurry to the unsterilized slurry to preheat the unsterilized slurry and cool the sterilized slurry,
 - a piping circuit connecting the pump to the heat exchanger and connecting the heat exchanger to the sterilizing unit for handling the unsterilized slurry, and connecting the sterilizing unit to the heat exchanger and exiting the heat exchanger for handling the sterilized slurry, and
 - 10 a pump for intaking unsterilized slurry and pumping slurry through the piping circuit at a predetermined pressure at a predetermined flow rate.

AMENDED SHEET

PCT/US99/11709
1PEA/US 12 JUN 2000

11

12. The fluid handling and sterilizing apparatus of claim 11, wherein the sterilizing unit includes

a heating unit,

a second heat exchanger for transferring heat from the heating unit to the unsterilized slurry to raise the temperature of the unsterilized slurry to a sterilizing temperature,

a manifold for containing the heated slurry at the sterilizing temperature, and

a third heat exchanger for transferring heat from the sterilized slurry to the heating unit to cool the sterilized slurry.

13. The fluid handling and sterilizing apparatus of claim 12, wherein the manifold is sized to maintain the slurry at the sterilizing temperature for a predetermined time sufficient to fully sterilize the slurry.

14. The fluid handling and sterilizing apparatus of claim 12, wherein the heating unit comprises

a hot water boiler for heating water to a second predetermined temperature,

a second piping circuit interconnecting the hot water boiler, the second heat exchanger, and the third heat exchanger, and

a second pump for pumping water through the second piping circuit at a second predetermined flow rate.

15. The fluid handling and sterilizing apparatus of claim 14, wherein the first predetermined flow rate is about 17 psig, and the second predetermined flow rate is about 30 psig.

16. The fluid handling and sterilizing apparatus of claim 11, including a source of contaminatable slurry in the form of kaolin or calcium carbonate.

AMENDED SHEET

PCT/US99/11709
IPEA/US 12 JUN 2001

12

17. The fluid handling and sterilizing apparatus of claim 11, where the pump is a peristaltic pump.

18. The fluid handling and sterilizing apparatus of claim 11, including a mobile platform mounting the apparatus to enable transportation to a variety of locations.

AMENDED SHEET

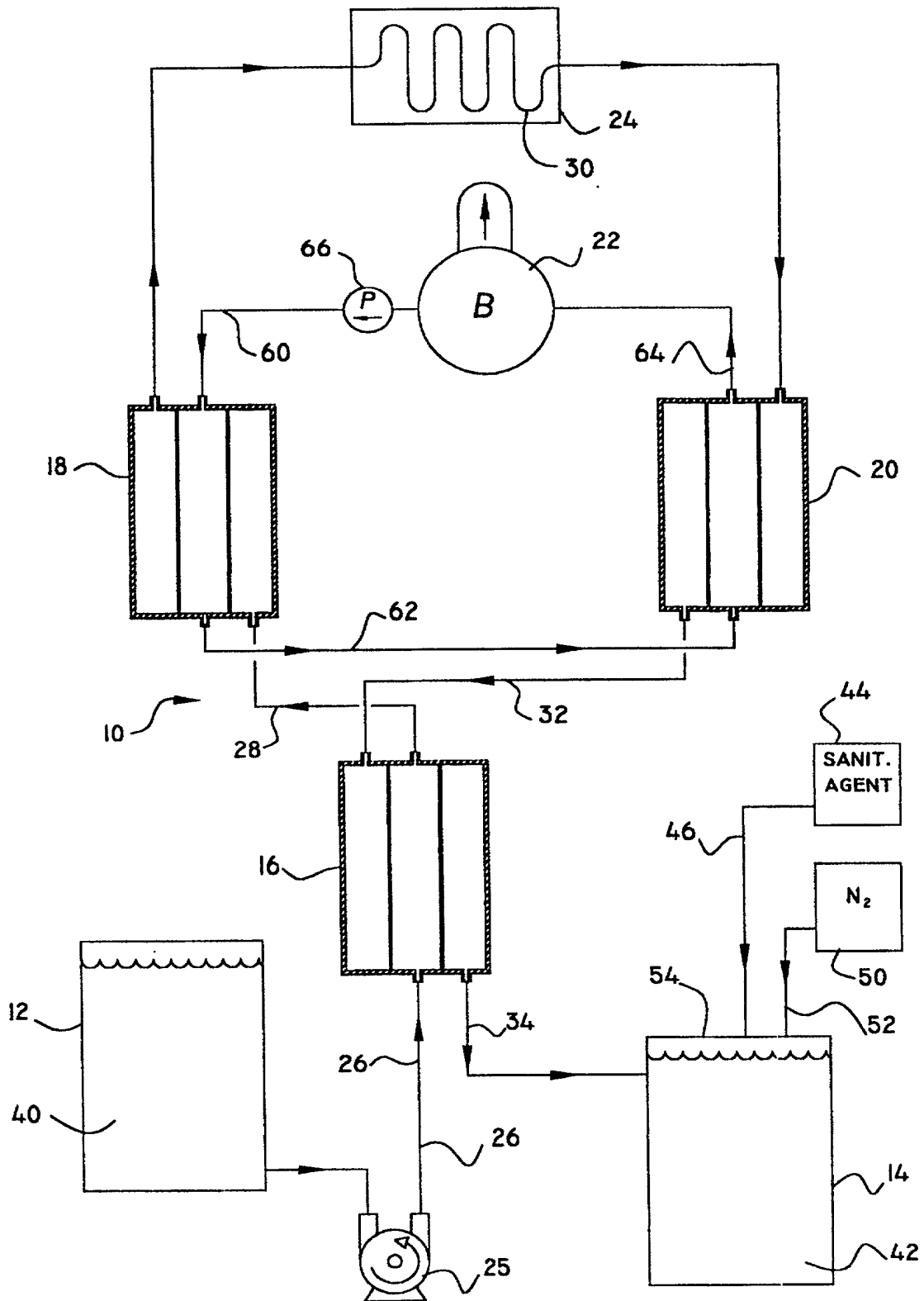


FIG. 1

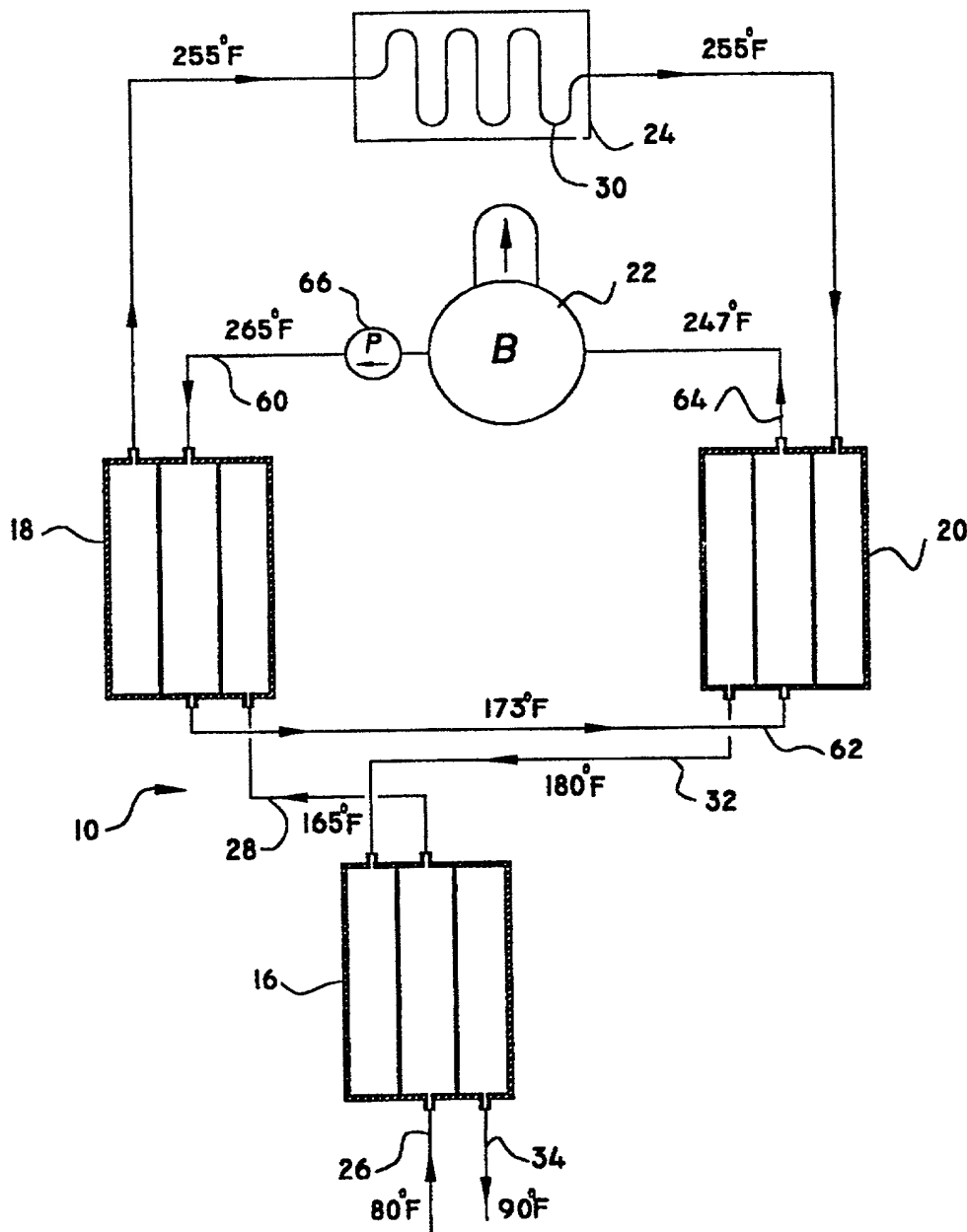


FIG. 2

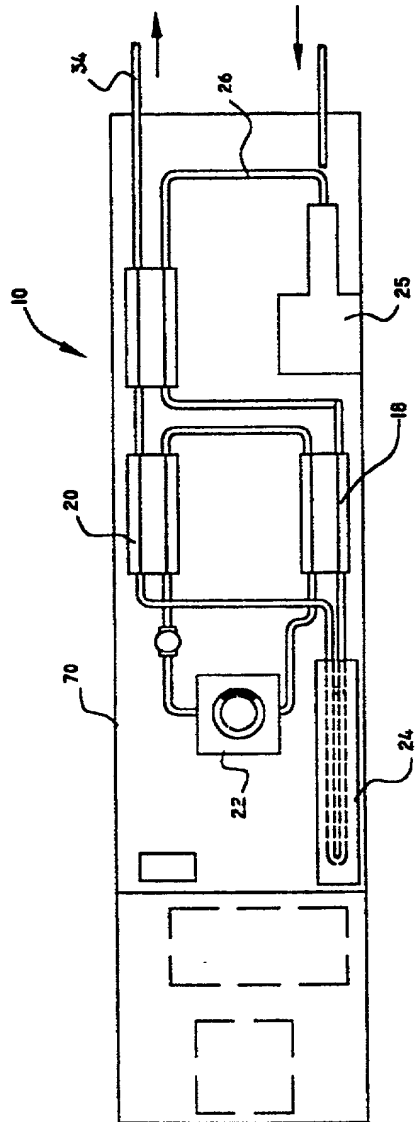


FIG. 3

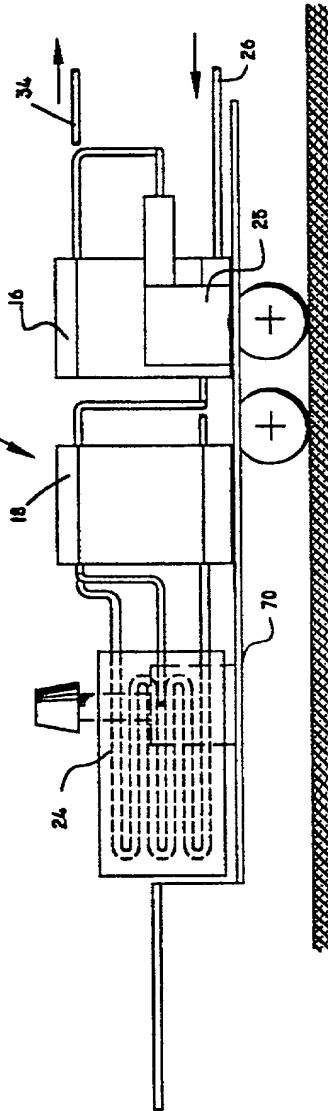
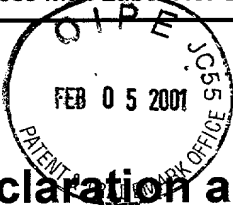


FIG. 4

Docket No.
30427

#3

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
SLURRY TREATMENT AND SHIPPING METHOD

the specification of which

(check one)

☐ is attached hereto.

☒ was filed on 27 MAY 1999 as United States Application No. or PCT International

Application Number PCT/US99/11709

and was amended on 16 JULY 1999 AND 12 JUNE 2000

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

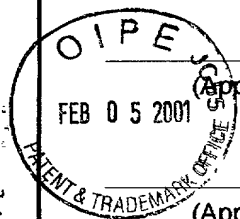
I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Not Claimed

<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	
<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	
<u> </u>	<u> </u>	<u> </u>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional



60/087375

28 MAY 1998

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

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27 MAY 1999

PENDING

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

① **DAVID A. GREENLEE, REG. NO. 20825**



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Citizenship US	
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MACON, GA 31210	

Full name of second inventor, if any	
Second inventor's signature	Date
Residence	
Citizenship	
Post Office Address	